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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/541,089	03/31/2000	Hiroaki Takeuchi	0397-0404P	4024

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EXAMINER

PADGETT, MARIANNE L

ART UNIT

PAPER NUMBER

1762

DATE MAILED: 11/07/2002

/0

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/541,089

Applicant(s)

Hiroaki et al

Examiner

MIL Padgett

Group Art Unit

1702

— The MAILING DATE of this communication appears on the cover sheet beneath the correspondence address —

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, such period shall, by default, expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

☒ Responsive to communication(s) filed on 7/15/02

☒ This action is FINAL.

- ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

☒ Claim(s) 1, 4-8 is/are pending in the application.

Of the above claim(s) is/are withdrawn from consideration.

☐ Claim(s) is/are allowed.

☒ Claim(s) 1, 4-8 is/are rejected.

☐ Claim(s) is/are objected to.

☐ Claim(s) are subject to restriction or election requirement

Application Papers

☐ The proposed drawing correction, filed on is ☐ approved ☐ disapproved.

☐ The drawing(s) filed on is/are objected to by the Examiner

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119 (a)-(d)

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119 (a)-(d).

☐ All ☐ Some* ☐ None of the:

☐ Certified copies of the priority documents have been received.

☐ Certified copies of the priority documents have been received in Application No. _____.

☐ Copies of the certified copies of the priority documents have been received

in this national stage application from the International Bureau (PCT Rule 17.2(a))

*Certified copies not received: _____

Attachment(s)

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). _____

☐ Interview Summary, PTO-413

☐ Notice of Reference(s) Cited, PTO-892

☐ Notice of Informal Patent Application, PTO-152

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Other _____

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1. It was previously noted that the relationship of parameters in claim 1 read on any pressure at 500 torr or less that is used with a high frequency power of 2.5 GHz or 2.5×10^9 Hz, or less. High frequencies may be considered to go down to 300 KHz or 3×10^5 Hz, which would give a lower pressure limit of 0.06 torr. For the standard RF frequency of 13.56 MHz, applicant's formula gives $(2 \times 10^{-7})(13.56 \times 10^6)$ torr = 2.712 torr $\leq P \leq 500$ torr.

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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3. Claims 1, 4, 5 and 8 are rejected under 35 U.S.C. 102(e) as being clearly anticipated by Foster et al.

Foster et al teach a PECVD process where a showerhead positioned above a substrate is also an RF electrode. The useful applied frequencies are taught to range from 450 KHz to 13.56 MHz, while useful pressure are given as 0.5 to 100 torr in the reaction or deposition space (Abstract; col. 4, lines 8-30 and 53-60; col. 5, lines 32-col. 6, line 14; col. 7, lines 40-68*; col. 8, lines 39-55*; col. 12, lines 1-11 and 44-55). Foster et al discuss various Ti and TiN depositions on col. 12-17, which tables 4, 5 and 6 being of particular interest as using parameters of 5 torr total pressure at 450 KHz, where gases of TiCl_4 (5 or 10 sccm), H_2 (5,000 sccm or 3,750 sccm) and Ar (0.5 or 0.3 slm), have proportions that would appear to provide partial pressures of reactant gas TiCl_4 within the claimed ranges. In col. 16, lines 15-24, it is noted that the higher pressure (5 vs. 1 torr) provides a more stable and symmetric plasma, and that the addition of Ar increases the plasma stability and intensity, such that 0-10 slm Ar flow is preferred for this particular reaction.

In order for a reference to be anticipatory for a process claim, it is not necessary for the entire range of a parameter(s) in the claim to be taught, but sufficient that all parameters in the claim have values within taught ranges that overlap in both the reference and the claim. The formulas' in the claims are a mode of writing a range limitation, empirically providing values which are consistent with values taught by Foster et al, thus Foster et al performs the process within the criteria claimed, hence is

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appropriately considered as anticipatory. One need not explicitly recite the claim formulas in order to do the process as claimed.

4. Claims 6-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Foster et al.

Foster et al's specific example does not use the inert gas He, nor specify $10 \text{ MHz} \leq f \leq 500 \text{ MHz}$, plus $100 \leq P \leq 500 \text{ torr}$, however as the benefits to plasma stability and intensity, of using Ar, an inert gas, is taught, it would have been obvious to one of ordinary skill in the art that other inert gases, such as He, would have been expected to be equally useful, because they are homologous, i.e. have like chemical and plasma properties, and are well known for use as both plasma and carrier gases.

Foster et al's taught generic ranges include both 13.56 MHz and 100 torr explicitly, hence it would have been obvious to one of ordinary skill to expect these to be useful together in PECVD process as suggested by Foster et al's teachings, that are inclusive of these values and because one would optimize for variations in types of depositions being preformed, etc.

5. Claims 1 and 4-8 are rejected under 35 U.S.C. 102(e) as being clearly anticipated by Yamazaki.

The arguments for maintaining the anticipatory rejection over Yamazaki et al, are analogous to those stated above in section 3, since reciting a Formula (empirical) that reads on parameter values that have been used in the prior art, does not make a new process, merely a new way of describing an old technique.

Yamazaki et al teach various high frequency plasma apparatus, where there is a discharge between two opposed electrodes, one holding a substrate. The pressure between the electrodes is taught to be 15 torr to 100 torr, although higher pressures are also discussed. The RF frequency taught to be applied with these pressures is 13.56 MHz. See the abstract; figures (9, 13, etc); col. 3, lines 54- col. 4, line 8; col. 6, lines 18-57; col. 7, lines 3-26 (He + hydrocarbon deposition gas, 60-100 torr); col.17, lines 1-32 (13.56 MHz, 100 torr, He:CH₄ at 100 sccm:10 sccm); col. 18, lines 28- col. 20, line 59 (more examples).

6. A small sampling of other references that also have frequency and pressure parameters consistent with the ranges defined by applicants' formula include:

Mar et al, Gupta et al, Lee et al, Perng et al, Sharan et al and Chang et al..

7. Applicant's arguments filed July 15, 2002 and discussed above have been fully considered but they are not persuasive.

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

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extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to M. L. Padgett whose telephone number is (703) 308-2336. The examiner can normally be reached on Monday-Friday from about 8 a.m. to 4:30 p.m.; and fax numbers (703) 872-9311 for (after final official) and (703) 305-6078 (unofficial).

M.L. Padgett/dh
October 30, 2002
November 6, 2002



MARIANNE PADGETT
PRIMARY EXAMINER